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Pure Sodium Chloride

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PURE SODIUM CHLORIDE.

NICHOLAS KNIGHT.

It is often convenient and necessary to have on hand a supply of pure sodium chloride for the preparation of standard solutions. It is quite easy to obtain the substance with a "C. P." label, but it does not always follow that the article is as pure as the label may indicate.

It seems to be a difficult matter to obtain common salt that is entirely free from potassium chloride. We have prepared sodium chloride by different methods. We have tested these and also the various samples we had on hand in the laboratory stock room, and have usually found a small quantity of potassium chloride present.

1. We prepared a saturated solution of ordinary common salt, into which we passed hydrogen chloride, made by heating pure concentrated hydrochloric acid. We filtered off the salt crystals using a pump and after drying we obtained 0.42 per cent of potassium chloride.

2. We dissolved 100 grams of ordinary common salt in 300cc water and filtered into an evaporating dish. This was heated to boiling, and milk of lime added in small excess. The precipitate was filtered off, and the excess of calcium and barium precipitated with sodium carbonate. It was again filtered and the excess of sodium carbonate was changed to sodium chloride with pure dilute hydrochloric acid. After drying we found in the specimen 0.32 per cent of potassium chloride.

3. We made a solution of caustic soda by dissolving metallic sodium in distilled water, and we neutralized this with pure hydrochloric acid. The analysis of the dried salt showed 0.27 per cent of potassium chloride. The sodium must have contained a small quantity of metallic potassium.

4. The foregoing experiment was repeated using the purest caustic soda in the laboratory that had not been purified by alcohol. The resulting sodium chloride showed 0.48 per cent potassium chloride.

We next examined three specimens of salt, each of which was supposed to be chemically pure. The following results in potassium chloride were obtained:

1. 0.57 per cent potassium chloride.
2. 0.45 per cent potassium chloride.
3. 0.49 per cent potassium chloride.

In each of the seven samples of salt examined, the presence of the potassium could be distinctly seen with the flame test, using a piece of blue glass.

The method we employed in separating the sodium and potassium chlorides is the following: We dissolved about a half gram of the salt in a little water and added perhaps twenty drops of a ten per cent solution of platinic chloride. Then we added a few drops of water and moved the mass back and forth till it flowed freely. There is some difficulty of manipulation here, as too little water would not dissolve all the Na_2 Pt Cl_6, and too much would dissolve some K_2 Pt Cl_6. We filtered and washed first, five or six times with one volume of water and a half volume of alcohol, then about six times with a mixture of alcohol and ether. After drying the precipitate, it was placed over a weighed platinum crucible and washed into the crucible with boiling water. It was evaporated to dryness on the water and dried in a thermostat at 105 degrees.

Our thanks are due Clifford Lahman and Lester Rusk for assistance in the analytical work.

BARIUM IN TOBACCO AND OTHER PLANTS.

NICHOLAS KNIGHT.

Scheele in 1788 first observed that barium is found in plants, as he obtained it from beech trees. Forchammer in 1855, detected its presence in the ashes of beech, oak and birch trees. In the same year, Eckhard and Boedeker confirmed its existence in beech and found it also in the sandstone near Goettingen.

In 1874, Knap of Leipzig, while investigating the mud carried down by the Nile river found that barium was present. The following year, Dwarzak confirmed the presence of barium in the Nile mud, and found it in the leaves, ear and stalk of wheat grown in the Nile valley.

A number of investigations have been made in the United States by the Bureau of Plant Industry and the Bureau of Soils, for the detection of barium. The work in this country has been done to ascertain, if possible, if the poisonous properties of the Loco weed which causes the Loco disease in cattle, is due to the presence of barium in the plant.

J. S. McHargue, Journal of the American Chemical Society, June, 1913, describes his work that shows the presence of barium in tobacco and in various others plants.

Many are doubtless more or less familiar with the wide distribution of barium in soils. The old igneous rocks have disintegrated into simpler compounds which finally have become available as food for the growing plant. It is still a question whether barium should be considered a plant food at all, although it is found more or less in the vegetable kingdom, but not in all the species that have been investigated.

We have examined the leaves and stems of a number of specimens of tobacco, grown in Sumatra, Cuba, and in various parts of the United States. We desire to express our thanks to Mr. J. M. Goldstein, of Oneida, New York, for kindly supplying most of the specimens.

Our method was essentially that outlined by McHargue in the paper referred to. We selected twenty-five grams of the leaves which were just sufficiently moist to prevent crumbling. These were cut into small bits and placed under a hood as the odors are very disagreeable. The combustion is made with one Tirrell burner in about two hours. Too great heat is not desirable as it fuses the ash and renders it more difficult to handle. The ash is weighed and while in the platinum dish, it is dampened with distilled water, 15cc. of hydrochloric acid is added, and it is heated twenty minutes on the water bath to complete the reaction. There are two conditions in which the barium seems to exist in the ash—a part soluble in hydrochloric acid, and an insoluble portion which is barium sulphate. The precipitate containing the barium sulphate with the ashes of the filter paper is placed in a platinum crucible to which are added a few drops of dilute sulphuric acid and 10cc. of hydrofluoric acid. It is digested slowly for several hours over a free flame. This decomposes the silicates, and the residue is evaporated to dryness. Next a sodium carbonate fusion is made with about four grams to decompose the barium sulphate.

The residue is changed to barium chloride with hydrochloric acid and added to the first hydrochloric acid filtrate. These are heated to boiling and the barium precipitated in the usual way with a few drops of sulphuric acid. We treated the stems in the same way.

As the ash is chiefly carbonates, we found difficulty in getting a constant weight, as the CO_2 would be driven off by the heat. The per cent of the ash represents the mean of two or more determinations.

Kind of Tobacco	Per cent of Ash	Per cent of $BaSO_4$ in the Plant
Havanna Tobacco from Cuba—		
Leaf	20.85	.0608
Stem	25.68	.0760
Broad leaf grown in Pennsylvania—		
Leaf	21.98	.0648
Stem	21.62	.0780
*Havana seed grown in Connecticut		
Leaf	20.11	.0600
Stem	19.38	.0720
Pennsylvania Tobacco grown in Pennsylvania—		
Leaf	21.48	.0980
Stem	24.28	.1280
Sumatra Tobacco—		
Leaf	20.81	.0308
Stem	24.73	.0408
Wisconsin Tobacco grown in Wisconsin—		
Leaf	21.62	.0192
Stem	24.49	.280
Tobacco from farm of Leon Bequillard, Mexico, N. Y.—		
Leaf		.0132
Stem		.0504

*Grown under canvas tents.

Kind of leaf	Per cent of $BaSO_4$
Dogwood leaf	.0224
Cottonwood leaf	.0052
Cherry leaf	.0392
Black locust	.0324
Mulberry leaf	.0696
Elm leaf	.0356
Linden leaf	.0152
Wild olive	.0048
Plum	.0372
Box elder	.0360
Hard maple	.0368
Walnut	.0752
Pear	.0196

The leaves were taken from trees on the Cornell College campus, or from the village of Mount Vernon. They were gathered in the autumn and so were mature leaves. An analysis of a sample of soil from the campus showed .1312 per cent of barium sulphate.

We desire to express our hearty thanks to Harold L. Maxwell and Lester W. Rusk for making the analyses of this paper.

SOME ROCK ANALYSES.

NICHOLAS KNIGHT.

I. A specimen from the Plains of Abraham.

The rock was picked up on the Plains of Abraham, above Quebec, but came from a quarry in the neighborhood. The analysis was made by Mr. O. E. LaRue, and shows the rock to be a sandstone with a considerable admixture of Calcium and Manganese Carbonates. The result is as follows:

	Per cent
SiO_2	54.54
Fe_2O_3	5.37
Al_2O_3	6.64
$CaCO_3$	15.12
$MnCO_3$	18.33
	100.00

The specific gravity is 2.69.

II. A specimen from the Alps.

The rock was obtained from the Alps near Lucerne, Switzerland, and is used there as a building and road material. The analysis by C. M. Peddycoart shows it is an impure limestone.

	Per cent
SiO_2	11.81
Fe_2O_3	4.21
Al_2O_3	1.15
$CaCO_3$	70.23
$MgCO_3$	8.17
H_2O	4.26
	99.83

III. Limestone from the Madeira Islands.

The Madeira Islands lie northwest of Africa and about three hundred and sixty miles from the coast. The group belongs to Portugal. The soil is very fertile, and the tropical and subtropical vegetation is very luxuriant. The specimen is a limestone, as the analysis by Henry F. Carlton shows.

	Per cent
SiO_2	1.17
Fe_2O_3	0.61
$CaCO_3$	94.11
$MgCO_3$	4.21
	100.10

This specimen represents the paving material used at Funchal, the chief city of the Islands. Automobiles are now invading the locality but the former rapid transit was the toboggan used in the streets for descending the hills and mountains, and the primitive ox cart. The paving from this rock wears to a smooth, hard metallic-like surface which facilitates the traffic.

IV. Igneous rock from Madeira.

This is a brownish appearing rock which easily disintegrates and crumbles to a fine powder. It seems to be the origin of the fertile soil of the islands. The analysis was made by Miss Nela Smart.

	Per cent
SiO_2	43.96
Fe_2O_3	15.02
Al_2O_3	12.44
$CaCO_3$	15.49
$MgCO_3$	9.05
TiO_2	2.02
Na_2O	0.68
K_2O	0.15
H_2O	1.05
	99.86

This group of islands is of volcanic origin.

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